

Software Requirements Specification

Software Engineering & Project

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1 Introduction

1.1 Purpose

This report is to describe the software requirements specification of the lunar rover project.

1.2 Document Conventions

The document conventions in this project include the following main points....

1.3 Intended Audience and Reading Suggestions

The intended audience of this document are the Client, this project team and project supervisor.

1.4 Project Scope

The scope of this project is to demonstrate a prototype for a lunar robot, which is capable of performing an automated survey of a extraterrestrial landscape.

This robot is to be constructed using the EV3 Lego Mindstorms robot provided by the client. It is to be controlled via a remote location, but is required to automatically make decisions based on the environment around it.

1.5 References

1. Client Specifications,
2. Project Specifications,
3. Ev3 kit

2 Overall Description

2.1 Product Perspective

2.2 Product Features

2.3 User Classes and Characteristics

2.4 Operating Environment

2.5 Design and Implementation Constraints

2.6 User Documentation

2.7 Assumptions and Dependencies

3 User Requirements

4 System Features

5 External Interface Requirements

5.1 User Interfaces

5.2 Hardware Interfaces

5.3 Software Interfaces

5.4 Communications Interfaces

6 Other Non-Functional Requirements

6.1 Performance Requirements

Map Accuracy

Description: The visual representation of the map shall be as accurate as possible. The various objects and hazards that the robot encounters must be recognized and drawn as soon as the robot encounters them.

Rationale: The client must be able to use the map for other purposes once the crash site has been found and therefore is relying on the map to be an accurate representation of the environment. In addition, the robot must be able to use the map to determine where past obstacles were to allow for smooth navigation and to avoid unnecessary travel time.

Speed

Description: The surveying of the land and discovery of the goal shall be completed in reasonable time. For this prototype, this shall be interpreted as no more than 25 minutes to complete the journey from landing to returning to the landing zone after completing the goal. On manual control this shall be determined by the operator of the robot but will not be allowed to exceed a specified limit for safety purposes.

Rationale: The robot will have a limited power supply and must be able to

complete its mission before that power runs out.

6.2 Safety Requirements

Significant Impact

Description: While on autopilot, the robot shall not exceed $0.3m/s$. When detecting an obstacle, the robot shall stop within 0.15 metres before collision to avoid significant impact and to allow for turning room. During prototype testing, a collision will be deemed significant impact if the robot manages to physically move an obstacle. The manual controller shall default to no more than $0.3m/s$ however the pilot may have additional speed options available to them.

Rationale: The safety of any persons on the landing site is paramount and a collision of the actual robot to any persons may lead to severe injury or death. The prototype is also representing a robot that will be expensive to repair and significant damage to the robot may lead to irreparable damage and failure of the mission.

No Go Zones

Description: No more than half the robot may enter the NGZ at any time.

Rationale: An NGZ may represent an area where personnel are active or may indicate an area of known hazardous materials or obstacles otherwise not detectable by the robot. For the safety of the personnel and the robot, the prototype must be able to demonstrate the ability to maneuver its way out of an NGZ without risking injury to personnel or getting stuck in a hazardous area.

6.3 Security Requirements

Unauthorized Access

Description: The GUI shall have a login section where a username and password is presented and verified before the controller can be used.

Rationale: Unauthorized use of the robot may lead to damage or loss if targeted by malicious competition or an individual who has not been verified by the client.

6.4 Software Quality Attributes

Ease of use

Description: The GUI shall have intuitive controls and clearly marked buttons. The size of the controller and map shall be set to a size that is sufficient for comfort and legibility. The visual style of the GUI will conform to the standards of similar controller layouts commonly found in maps and remote controllers.

Rationale: The Client will have limited time to spend learning controls and must be able to intuitively navigate the GUI without much training. This should

include importing and exporting map data.

7 Other Requirements

8 Appendix A: Glossary

NGZ: No-Go Zone

9 Appendix B: Analysis Models

10 Appendix C: Issues List